CHAPTER 2
ALTERNATIVES CONSIDERED

INTRODUCTION

Chapter 2 provides information on how the public was involved in providing comment on this Project, how the alternatives were developed, and a description of how issues and alternatives were addressed in this document. This is followed with a description of the four alternatives that are studied throughout the document, a description of adaptive management, a brief economic comparison of the alternatives, and a list of mitigation measures. A summary comparison and maps of the four alternatives can be found at the end of the chapter.

PUBLIC INVOLVEMENT

A public scoping letter was sent to more than sixty interested citizens or agencies on December 18, 2002 asking for comments on the Gallatin National Forest invasive weed control proposal. A Notice of Intent to prepare an EIS on this proposal was published in the Federal Register on January 17, 2003. Publication of the notice initiated a public scoping period that ended February 28, 2003. A Legal Notice was also published in the Bozeman Chronicle on January 12, 2003. In total, written comments were received from EPA and the Ecology Center, during the scoping period.

Comments received during scoping were evaluated to determine potential issues and the identified issues were then categorized according to relevance to the purpose and need. The categories included significant issues, concerns, and issues beyond the scope of the purpose and need for this project (see project file for content analysis on scoping letters). Also, included in the content analysis are those suggestions for mitigation measures, monitoring recommendations, and alternatives. Significant issues were used to develop alternatives to the proposed action. Concerns were used to help define the scope of analysis. Issues that were considered outside the scope of the EIS are described in this chapter, along with alternatives that were dismissed from detailed analysis. Mitigation measures and monitoring that were identified from scoping are listed near the end of this chapter.

ALTERNATIVE DEVELOPMENT PROCESS

Comments from the public and from the Gallatin National Forest resource specialists were used to determine issues of concern that could result from implementing the Proposed Action. The following issues were considered to be significant because there is uncertainty regarding the effects of the proposed action. The best way to analyze the issue is through development of alternatives that displays the effects and trade-off between different alternative actions. The effects are measured by an "Issue Indicator" and are summarized in the "Summary Comparison of Alternatives" section at the end of the chapter and also discussed in Chapter 4.

The issues that drove the development of different alternatives include the concern of potential impacts of herbicide on human health, the potential effects of herbicides on wildlife and aquatic resources, and the potential effects of aerial application. In response to these issues four alternatives were developed: the Alternative 1 - Proposed Action Alternative (included the use of both ground and aerial application of herbicide), Alternative 2 - No Herbicide Alternative,

Alternative 3 - No Action (no change from current management decision covered under the 1987 Gallatin Noxious Weeds EIS and the 1992 East Dam Spotted Knapweed EA), and Alternative 4 - No Aerial Application Alternative.

ISSUES USED TO EVALUATE ALTERNATIVES

Key Issue 1: Potential effects of herbicides on Human Health-

A letter received from The Ecology Center was concerned with potential impacts on human health from the use of herbicides to control weed infestation. More specifically they were concerned about the acute toxicity, the carcinogenicity and the effects of low-level exposure. They were also concerned about the amounts and combination of herbicides and the synergistic effects of herbicide combinations. Also, they wanted to know how people who are sensitive to herbicides would be protected.

Potential effects on human health from herbicides use have been addressed and considered by the EPA (Environmental Protection Agency), as well as the Forest Service. A list of documents assessing risk to human health is contained in the Human Health section of Chapter 4.

Issue Indicators:

- Potential for exposure in excess of safe reference dose.

Key Issue 2: Potential Effects Of Aerial Application of Herbicides-

The Ecology Center expressed concern about herbicide drifting from treatment areas into riparian areas, streams, and other lands with unintended consequences. The specific concern was that aerial applied herbicides could not be effectively controlled. Aerial application has a greater risk for drift and collateral damage to non-target species.

Issue Indicator:

- Potential for spray drift

Key Issue 3: Potential Effects of Herbicide on Aquatic Resources-

Both the Ecology Center and the Environmental Protection Agency expressed concern about effects of herbicides used for weed control on water quality and aquatic organisms (fisheries, insects and amphibians).

Issue Indicator:

- Impacts that exceed regulatory compliance thresholds;
- Potential impact of herbicides to non-target resources.

Key Issue 4: Potential Effects of Herbicide on Wildlife-

The Ecology Center expressed concern about the effects of herbicides on wildlife, and the risk of bio-accumulation of herbicides within the environment.

Issue Indicator:

- Impacts that exceed regulatory compliance thresholds;
- Potential impact of herbicides to non-target resources.

ISSUES AND ALTERNATIVES NOT STUDIED IN DETAIL

A few issues raised during the scoping period were not analyzed in detail because: 1) there are no direct or indirect effects from the proposed action; 2) the issue is outside of the scope of decision; or 3) past research and analysis show no significant effects for similar actions.

Several alternatives for the proposed project were considered but eliminated from detailed analysis. Reasons for their dismissal include not meeting project purposes and needs; not meeting CEQ (NEPA) guidelines of being reasonable, feasible, and viable; not differing substantially from other alternatives being analyzed in detail; being beyond the scope of the EIS; and/or not complying with current laws, regulations, policies, and Forest Plan direction.

Prohibit all activities that spread weeds. An alternative that alters or eliminates activities that provides vectors for weed infestation and spread, was identified by the public during scoping for consideration as an alternative to be analyzed in the EIS. The intent of the alternative is to address and take action on human activities that promote the spread of weeds, specifically, close roads, modify authorized livestock grazing permits, and alter or eliminate existing timber, mining and recreational OHV activities. These human uses and activities are authorized through previous decisions made in the Record of Decision for the Gallatin National Forest Plan, which incorporates requirements of several public land laws and regulations authorizing multiple uses on National Forest Systems lands. Taking action on activities, authorized under existing public laws, regulations, permits, and the Gallatin Forest Plan, which may contribute to the spread of weeds, is beyond the scope of this EIS and will not be considered further.

No Weed Treatment. An alternative that discontinues the current weed management program was considered but eliminated from detailed analysis because it does not meet any of the project purposes, does not comply with the Forest Service's Integrated Pest Management program, is inconsistent with Forest Service policy that noxious weeds and their adverse effects be managed on National Forests, and violates federal and state laws and executive orders. It also would be irresponsible of the Forest Service to ignore weeds on the Gallatin National Forest when their presence may impact weed control on adjacent private and public lands.

Use herbicide only after other treatment methods failed. Other alternatives also eliminated from detailed analysis included mechanical, vegetative, biological, and combinations of treatments followed by herbicides application if these treatments are unsuccessful. This alternative was eliminated because there is concern that if the non-herbicidal treatments fails and some time passes before this failure is determined, the subsequent weed infestation may have expanded substantially beyond the original acreage, thus further impacting forest resources. The need for increased follow-up herbicide treatments would then have greater potential impacts than the original action. Such an occurrence would not be consistent with meeting project purposes and needs.

ISSUES AND ALTERNATIVES CONSIDERED IN DETAIL

In addition to the key issues identified earlier other concerns were expressed and mitigation measures were developed that reduces their significance. These concerns analyzed in Chapter 4, include the following:

- Effects of weeds and weed treatment on native vegetation, and sensitive plants;
- Effects of herbicide use on soils and groundwater quality;
- Effects of weed treatment on wilderness, wilderness study areas, inventoried roadless areas, wild and scenic rivers, and research natural areas; and
- Effects on recreation users.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative 1 – Proposed Action

The Gallatin National Forest proposed weed control on 13,260 acres (10,600 acres noxious weeds, 1,995 acres invasive plants, and 665 acres tall larkspur control). Actual treatment would provide for:

- 5,179 acres ground herbicide application;
- 255 acres aerial herbicide application;
- 4985 acres biological control (herbicide treatment will be used along the perimeter and small patches to contain the weeds);
- 41 acres pulling (herbicides may be used to reduce plant density to low levels, then pull isolated plants);
- 2135 acres cultural (herbicides or grazing may be used to reduce plant density then plant more desirable vegetation);
- 665 acres of larkspur control through herbicide, fertilizing, mineral supplement, sheep grazing, and supplementing native biological control agents.

Implementation would occur over a 5 to 15 year period. Not all acres would be treated every year. Acres treated will depend on available funding and on a priority rating system described in Table 2-1. Most areas would be treated repeatedly for 5 to 8 years to ensure effective control. Monitoring would be used to determine effectiveness and to identify areas that would need to be re-treatment or if treatment areas could be reduced based on effectiveness of previous treatments.

Table 2-2 has a current list of invasive plants that will be treated. Under Alternatives 1, 2 and 4 the list will be updated as new plants are recognized as a threat to the ecosystem. Alternative 3 is limited to the plants listed in the 1987 Gallatin Forest Noxious Weeds Control EIS, and the 1992 East Dam Spotted Knapweed Infestation EA (i.e., spotted knapweed and leafy spurge). Tall larkspur control would occur separately on a case-by-case basis between the allotment permittee and the responsible District Range Management Specialist.

Table 2-1. Gallatin National Forest Weed Treatment Priority Rating System.

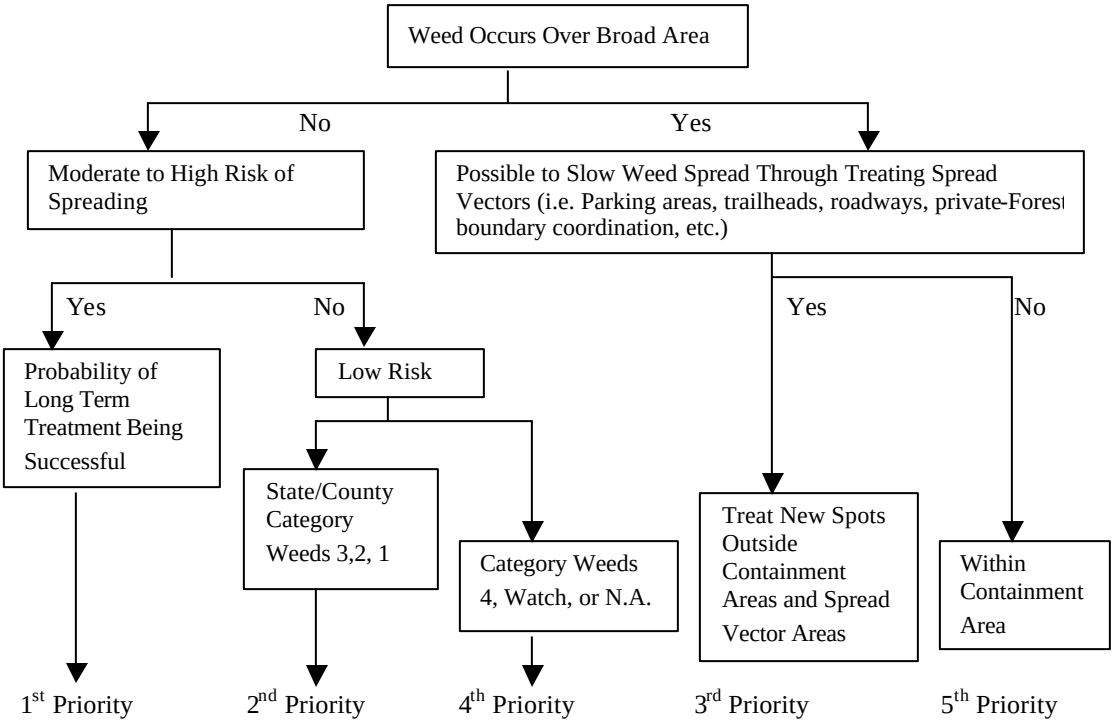


Table 2-2. Invasive Plant Species List as of 2004. This list will change as new plants are determined to be a threat to the ecosystem.

Montana State Noxious Weed List -2003		**County Noxious Weeds (combines Carbon, Gallatin, Madison, Meagher, Park, and Sweet Grass Counties) and additional invasive plants for the Gallatin National Forest**	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Category 1*			
Canada thistle	*Cirsium arvense*	common burdock	*Arctium minus*
common tansy	*Tanacetum vulgare*	common cocklebur	*Xanthium strumarium*
Dalmatian toadflax	*Linaria dalmatica*	black henbane	*Hyoscyamus niger*
diffuse knapweed	*Centaurea diffusa*	field scabious	*Knautia arvensis*
field bindweed	*Convolvulus arvensis*	meadow knapweed	*Centaurea pratensis*
hounds-tongue	*Cynoglossum officinale*	mullien	*Verbascum thapsus*
leafy spurge+	*Euphorbia esula*	musk thistle	*Carduus nutans*
ox-eye daisy	*Chrysathemum leucanthemum or Leucanthemum vulgaris*	poison hemlock	*Conium vulgare*
St Johnswort (goatweed)	*Hypericum perforatum*	Absinth wormwood	*Artemisia absinthium*
Spotted knapweed+	*Centaurea maculosa or C. biebersteinii*	Black henbane	*Hyoscyamus niger*
sulfur cinquefoil	*Potentilla recta*	Bull thistle	*Cirsium vulgare*
Russian knapweed	*Acroptilon repens or Centaurea repens*	Cheat grass	*Bromus tectorum*
yellow toadflax (butter and eggs)	*Linaria vulgaris*	Golden chamomile	*Anthemis tinctoria*
white top (hoary cress)	*Cardaria draba*	Perennial sowthistle	*Sonchus arvensis*
white top (hoary cress)	*Cardaria draba*	Plumeless thistle	*Caruus acanthoides*

Montana State Noxious Weed List -2003		County Noxious Weeds (combines Carbon, Gallatin, Madison, Meagher, Park, and Sweet Grass Counties) and additional invasive plants for the Gallatin National Forest	
Category 2 *		Scentless chamomile	*Anthemis arvensis*
dyer's woad	*Isatis tinctoria*	White bryony	*Bryonie albas*
meadow hawkweed complex	*Hieracium pratense, H.floribu*	Tall Larkspur	*Delphinium occidentale*
orange hawkweed	*Hieracium aurantiacum*		
perennial pepperweed	*Lepidium latifolium*		
purple loosestrife	*Lythrum salicaria or L. virgatum*		
tall buttercup	*Ranunculus acris*		
tamarisk	*Tamarix spp*		
tansy ragwort	*Senecio jacobaea*		
Category 3*			
common crupina	*Crupina vulgaris*		
Eurasian milfoil	*Myiophyllum sibiricum*		
yellow flag iris	*Iris pseudacorus*		
yellow starthistle	*Centaurea solstitialis*		
rush skeletonweed	*Chondrilla juncea*		

*Categories of weeds are based upon their distribution across the State. Category 1 weeds are currently established and generally widespread in many counties of the State. Category 2 weeds recently introduced or rapidly spreading from current infestation sites. Category 3 weeds are those not detected or found only in small, scattered, localized infestations.

[+]Only plants treated in Alternative 3, the 1987 Gallatin Noxious Weed Control EIS and Record of Decision emphasized only these two species. The 1992 East Dam Spotted Knapweed Infestation EA only addressed spotted knapweed.

A summary of the different treatment types for each alternative is provided in Table 2-3. Maps are included at the end of this chapter.

Table 2-3. Treatment Acres (gross area) for all Alternatives.**

Alt.	Biological control*	Cultural*	Mechanical*	Herbicide	Aerial	Tall Larkspur	No Treatment
1	4985	2,135	41	5,179	255	665	0
2	7,622	2,017	130	0	0	665***	2,826
3	535	0[+]	281[+]	346	0	0	11,538
4	5,086	2,135	41	5,179	0	665	153

** Some acres are counted more than once because more than one species is present on the same site and each species may have unique treatment strategy.

* For all alternatives except Alternative 2, herbicides will be used in conjunction with biological, culture and mechanical control methods.

[+] In the 1987 Noxious Weed EIS cultural treatments were grouped with mechanical treatments, as they are here.

*** No herbicides or fertilizers would be allowed but Silent Herder® mineral and native biological control supplementation would be permitted.

Under this Alternative new weed infestations could be treated provided that the steps identified in the Adaptive Management section are followed. All infestations will use the priority decision process outlined in Table 2-1 to determine the type of treatment on each weed infestation. Likewise, all infestations will use Table 2-6 to determine the appropriate treatment for new weed sites. If the weeds are in the Wilderness, then Wilderness Minimum Tool Guidelines found in Appendix C will be used.

One feature of Alternative 1 is the flexibility to use updated agents as they are registered and approved by the EPA. All herbicides will be applied according to label specification; or when additional mitigation is required by Forest Service policy as described in this chapter. Impacts on soil and water will be mitigated to meet Montana Water Activities and Pesticide Application Requirements, Northern Region Soil and Water Standards, and Gallatin Forest Plan Standards. Table 2-4 lists some of the herbicides addressed in this document.

Table 2-4. EPA Registered Herbicides Available for Control under Alternatives 1 and 4. Alternative 3 Proposes Using Only 2,4-D and Picloram.

Common Name	Partial List of Trade Names	Target Weed Species (general)
2,4-D*	Hi-Dep®, Weedar 64®, Weed RHAP®, Amine 4®, Aqua-Kleen	thistles, sulfur cinquefoil, dyers woad, knapweeds, purple loosestrife, tall buttercup, whitetop knapweeds
Chlorsulfuron	Telar®	dyer's woad, thistles, common tansy, houndstongue, whitetop, tall buttercup
clopyralid	Stringer®, Curtail®, Transline®, Redeem®	thistles, yellow starthistle, hawkweeds, knapweeds, rush skeletonweed, oxeye daisy
dicamba	Banvel®, Clarity®, others	houndstongue, yellow starthistle, common crupina, hawkweed, oxeye daisy, tall buttercup, blueweed, leafy spurge, tansy ragwort, knapweeds,
glyphosate	Roundup®, Rodeo®, Accord®, Glyphomate®	purple loosestrife, field bindweed, yellow starthistle, thistles, cheatgrass, common crupina, toadflax,
Hexazinone	Velpar®, Pronone 10G®	cheatgrass, oxeye daisy, yellow starthistle, thistles
Imazapyr	Arsenal®, Chopper®	dyers woad, field bindweed
Methsulfuron methyl	Escort, Ally	houndstongue, thistle, sulfur cinquefoil, common crupina, dyers woad, purple loosestrife, common tansy, whitetop, blueweed
Picloram*	Tordon®, Grazon®, Access®, Pathway®	thistles, yellow starthistle, common crupina, hawkweeds, knapweeds, rush skeleton weed, common tansy, toadflax, leafy spurge
Imazapic	Plateau®	cheatgrass, leafy spurge, toadflax
Sulfometuron methyl	Oust®	cheatgrass, whitetop, oxeye daisy, tansy ragwort, musk thistle
Triclopyr	Garlon®, Redeem®, Remedy®	hawkweed, sulfur cinquefoil, purple loosestrife, knapweed, oxeye daisy, thistle

Herbicides Treatments –

Herbicide selection would be based on environmental conditions such as groundwater depth, soil type, non-target vegetation, and management objectives. Table 2-5 displays examples of herbicides proposed for use and a range of application rates. Herbicide selection considers the following criteria:

- Herbicide label considerations;
- Herbicide effectiveness on target weed species;
- Proximity to water or other sensitive resources;
- Soil characteristics;
- Potential unintended impacts to non-target species such as conifers or shrubs;
- Application method (aerial, ground, or wick applicator);
- Other weed species present at the site, and effectiveness of herbicides on those species (for example spotted knapweed infestations with inclusions of toadflax);
- Adjacent treatments (private land);
- Timing of treatments (spring/fall); and
- Priority weed – new invaders vs. existing.

Table 2-5. Herbicide Application Rates and Timing.

Weed Species	Plant biology	Herbicide	Rate	Application Timing
Spotted knapweed Diffuse knapweed Yellow starthistle	Tap root	Tordon®	1 pint/ac	Active growth Bolt to early bud; fall
		Curtail®	2 quarts/ac	
		Transline®	2/3 pint/ac	
		2,4-D	1 quart/ac	Rosette to bolt
Sulfur cinquefoil	Tap rooted	Tordon®	1 pint/ac	Active growth
		2,4-D	1 quart/ac	Rosette to bolt
St. Johnswort	Perennial/Deep-root Rhizominous	Tordon®	1 pint/ac	Pre-bloom
		2,4-D	1 quart/ac	Seedling/pre-bloom
Canada thistle	Perennial/Deep-root Rhizominous	Tordon®	1 pint/ac	Late bolt pre-bud
		Curtail®	2 quarts/ac	Bolt - early bud
		Tarnsline®	2/3 pint/ac	Bolt to pre-bud
		2,4-D	1 quart/ac	Bolt
Musk thistle	Tap rooted	Tordon®	1 pint/ac	Rosette to bolt. Fall rosette
		Curtail®	2 quarts/ac	
		Tarnsline®	2/3 pint/ac	
		2,4-D	1 quart/ac	Rosette to bolt
Leafy spurge	Perennial/Deep-root Rhizominous	Tordon®	1 quart/ac	Full flower/fall
		Plateau®	8-12 oz/ac	Fall prior to frost
		2,4-D	1 quart/ac	Full flower
Dalmatian toadflax/yellow Toadflax	Perennial/Deep-root Rhizominous	Tordon®	1 to 2 pint/ac	Flower / fall
		Plateau®	8/10 oz/ac	Fall prior to frost
		Telar	1.5 oz/ac	Spring/fall
		2,4-D	1 to 2quarts/ac	Flower
Houndstonge	Perennial/tap root	Escort®	0.25-0.5 oz/ac	Rosette to bolt
		Telar®	1 oz/ac	Fall
		2,4-D	1 quart/ac	Rosette
Common tansy	Perennial/ Rhizominous	Escort®	0.3-1.0 oz/ac	Full flower/fall
		2,4-D	1 quart/ac	Full flower
Oxeye daisy	Perennial/Shallow – rooted / Rhizominous	Tordon®	1 pint/ac	Late bud/early bloom
		Escort®	0.05 oz/ac	
		2,4-D	1 quart/ac	
Russian knapweed	Perennial/Deep-root Rhizominous	Tordon®	1 pint/ac	Fall, early bud
		Curtail®	2 quarts/ac	Early bud
		Transline®	1 pint/ac	Early bud
		2,4-D	1 quart/ac	Early bud
Hawkweeds	Perennial//Rhizominous	Curtain®	2 quarts/ac	Rosette to bolt
Tansy ragweed	Perennial/fibrous root	Transline®	1 pint/ac	Rosette to bud; fall
Whitetop	Perennial/ Rhizominous	Escort®	03.-0.5 oz/ac	Rosette to pre-bud
		2,4-D	1 quart/ac	Rosette
Cheatgrass	Annual/fibrous root	Glyphosate	2-4 oz/ac	Early –pre-root development
Tall buttercup	Fibrous/Tap rooted	2,4-D	2 quarts/ac	Rosette to bolt
		Clarity	1 quart/ac	
Tall larkspur	Perennial/Tap Rooted	Tordon Escort	1 quart/ac .8-1.6 oz./ac	Rosette to bolt

Note: these are the most commonly used herbicides and rates are examples. In all cases, application rates would be those indicated on herbicide labels or less. On going testing may result in new instructions on rate and target species.

Herbicides, like biological control agents, go through an extensive screening and testing process before they are registered and approved for use, by the U.S. EPA. Initial pesticide registrations with the EPA typically require a minimum of 120 tests, take seven to ten years to complete, and cost between $30 and $50 million. Herbicide labels have the force of law and include safe handling practices, application rates, and practices to avoid undesirable impacts to humans and the environment.

Chemical treatments would include both ground and aerial herbicide applications, in compliance with the mitigation measures listed in this document. Chemical applications would take place at the appropriate time of year for targeted weed species and incorporate environmental considerations such as proximity to raptor nests or other resources of concern. Equipment such as helicopters, trucks, ATVs, horses, backpack sprayers, and other hand held application equipment will be used. Herbicides proposed for use include picloram, 2,4-D, clopyralid, dicamba, glyphosate, imazapyr, imazapic, hexazinone, chlorsulfuron, imazapic, metsulfuron methyl, sulfometuron methyl, and triclopyr. Following the Adaptive Management Strategy, other herbicides permitted by the EPA and registered for use by the Montana Department of Agriculture may be used when they become available, if the herbicide is water soluble and less environmentally persistent than picloram. This would occur after interdisciplinary review and line officer approval.

Surfactant adjuvant would be used in certain situations to increase efficacy, primarily on target species with a waxy cuticle (especially toadflax), or when temperature and humidity are not optimal (but still within label and more locally-prescribed limits) yet other conditions, such as plant phenology, are ideal. Surfactants may be used during period of drought. Surfactants proposed for use will follow the same mitigation measures as picloram. Only those labeled for use in and around water would be used within 50 feet of water, or the edge of sub-irrigated land, whichever distance is greater, or on high run-off areas. Some surfactants are labeled for use in and around water including Activate Plus ®, LI-700 ®, Preference ®, R-11 ®, Widespread® and X-77®.

Areas with aerial applications would also include ground applications, to treat buffer areas and skipped areas. These areas are estimated at 5 to 10 percent of the aerial treatment acres. Based on monitoring, follow-up aerial and ground treatments are expected to occur on third and fifth years after initial treatment, as portions of the dormant seed or root system propagate. Based on previous experience with weed treatments, it is likely that the treatment areas would then enter "maintenance mode" where spot treatments of infestations would continue to occur until weeds are eradicated. Aerial application will not be in designated wilderness areas, research natural areas, or near sensitive area (such as near water or sensitive plants). Sites identified for aerial treatment are either not accessible by roads (previous roads have been decommissioned) or have steep slopes which make the walking difficult.

Improper aerial application will not be allowed. All herbicide applicators, whether Forest Service or contractor employees, will follow label instructions. A field inspector will be on-site during all aerial applications to monitor drift and compliance with label specification. Label information is available in the Project File and at http://infoventures.com/e-hlth/, an Environmental Health Reference and Resource Materials website.

Ground applied herbicide treatments would occur in areas where there is good access, a manageable size of infestation, and available funding.

Biological Control Treatments –

Existing and newly approved biological controls would be introduced where appropriate. Some of the biological control agents in use are: thistle seed head beetles (*Ceutorhynchus litura*), knapweed seed head gall flies (*Urophora affinis, U.quadrifasciata,* and *Larinus minutus*), knapweed root feeding insect (*Agapeta zoegana*, and *Cyphocleonus achates*); leafy spurge flee beetles (*Aphona czwalilnae* and *A. lacertoa*); toadflax root boring beetles (*Mecinus janthinus*); and toadflax seed head beetles (*Gymnetron linariae* and *Brachyperolus pulicarius*) and a defoliating moth (*Calophasia lunula*). As of yet, only leafy spurge has a biological control agent that can substantially reduce plant density in a wide variety of sites. Sites with both large number of acres (more than 25 to 50 acres) and with weed species that have an effective biological control agent available, will be managed with biological control. Since biological control agents are usually very slow to establish and will never eradicate its host, these sites will need to be contained with the use of herbicides.

Cultural Treatments –

Cultural treatments, such as selective grazing or reseeding, would occur on sites where the native vegetation lends itself to this type of treatment. Four areas were identified by weed managers as being appropriate for cultural treatment:

1.) Durham meadow (T6S, R5E, Sec 12) in the Gallatin Canyon would see a change in grazing (from horses to high intensity short duration cattle grazing), followed with herbicide treatments, fertilization and re-seed to native grass (till and drill-seed into old fields);
2.) Gardiner valley (numerous locations) cheat grass and crested wheatgrass would be treated with herbicide and then planted with native grasses (till and drill-seed into old fields);
3.) Re-vegetate (plant with native grasses, shrubs and cottonwoods) an abandon gravel pit (T12S, R5E, Sec 17) after herbicide treatment; and
4.) Plant native grass and forbs after spraying orange hawkweed at Lonesomehurst summer-homes (T13S, R4E, Sec 33) near West Yellowstone.

Most of the other weed sites currently have an adequate source of native plants and do not require additional seeding with native species.

Mechanical Treatments -

Mechanical treatments, such as hand pulling, would occur on particularly sensitive areas, or areas of small infestations. Hand pulling is not effective on plants that spread via roots because the soil needs to be excavated repeatedly to remove all root fragments. Sites less than 0.1 acre with non-rhizomatous species and low weed density would be hand pulled. On some sites herbicides will be used in conjunction with pulling to help reduce plant density so that pulling is cost efficient.

Alternative 2 – No Herbicide

This alternative was requested by the public and describes a weed control program that does not use herbicides. Under Alternative 2 the following activities would occur: 130 acres of mechanical treatments (hand pulling), 2,017 acres cultural treatments (grazing and seeding with native plants), 7,622 acres with biological control agents, and 665 acres tall larkspur controlled with Silent Herder ® mineral and biological control agents. This alternative would also result in 2,826

acres not being treated for the following reasons: (1) there is not an approved biological control agent; (2) the weed patch is too large and can not be hand pulled because of lack of resources; and/or (3) the plant spreads via roots and extensive soil disturbance is not acceptable.

The effectiveness of these treatments is diminished because weed density will not be controlled with herbicides. Mechanical treatments will only occur in areas with low weed density (a few weeds per acres) for maximum cost effectiveness. Cultural treatments, such as seeding native plants without removing the weeds will cause a decrease in seedling survival due to plant competition. Biological control agents that are currently available will only reduce the plant density of a few weed species (most agents have not been effect as of yet) and will not prevent the weeds from spreading into new areas.

Alternative 3 – No Action, No Change from Current Weed Treatment

This alternative is the same as current management practices covered by previous NEPA decisions. No additional herbicide treatment would occur outside of those areas identified in the 1987 Gallatin National Forest Noxious Weeds Control EIS and the 1992 East Dam Spotted Knapweed Infestation EA. Alternative 3 would only treat spotted knapweed and leafy spurge on 346 acres with herbicides (only 2,4-D and picloram), treat 281 acres using mechanical and cultural treatments (the 1987 Noxious Weeds EIS combined these activities), and treat 535 acres with biological control agents. This Alternative would not treat 11,433 acres because they were not covered in previous environmental analysis.

Alternative 4 - No Aerial Treatment

This alternative is the same as Alternative 1 except that the aerial treatment sites will not be treated. Alternative 4 would treat 5086 acres with biological control, 2,135 acres using cultural treatments (grazing and seeding), 5,179 acres using herbicide treatment, and 41 acres using mechanical treatment. This alternative would not treat 153 acres because biological control insects are not available for the weeds present on the site, and access is too difficult for ground application of herbicide.

ADAPTIVE MANAGEMENT APPROACH

The following adaptive management strategy applies to Alternatives 1, 2 and 4, and is made up of two principle components:

1. To quickly and effectively treat newly discovered weed infestations, a decision tree based on site characteristics, weed species, and location would be used to select treatment methods (see Table 2-6).

Using an adaptive management approach will allow for treatment of new sites or new species without a lengthy delay while still addressing other resource concerns. Although treatments of noxious weeds are expected to be effective in reducing existing weed infestations, all infestations cannot be treated immediately due to budgetary and logistical constraints. Existing infestations will expand before they can be treated, and new areas will be identified. Since every acre of the Gallatin National Forest has not been inventoried for weeds many existing sites have yet to be identified. Also, new invasive weed species may be added to the invasive weed list and they will be incorporated into this analysis.

For analysis purposes, the adaptive management strategy in Alternatives 1, 2 and 4 assumed up to 25 percent more acres may be identified as needing treatment within the next 15 years (approximate life span for this EIS). It is possible that treatment success would offset new acres, resulting in little overall change in treatment acres. The strategy includes:

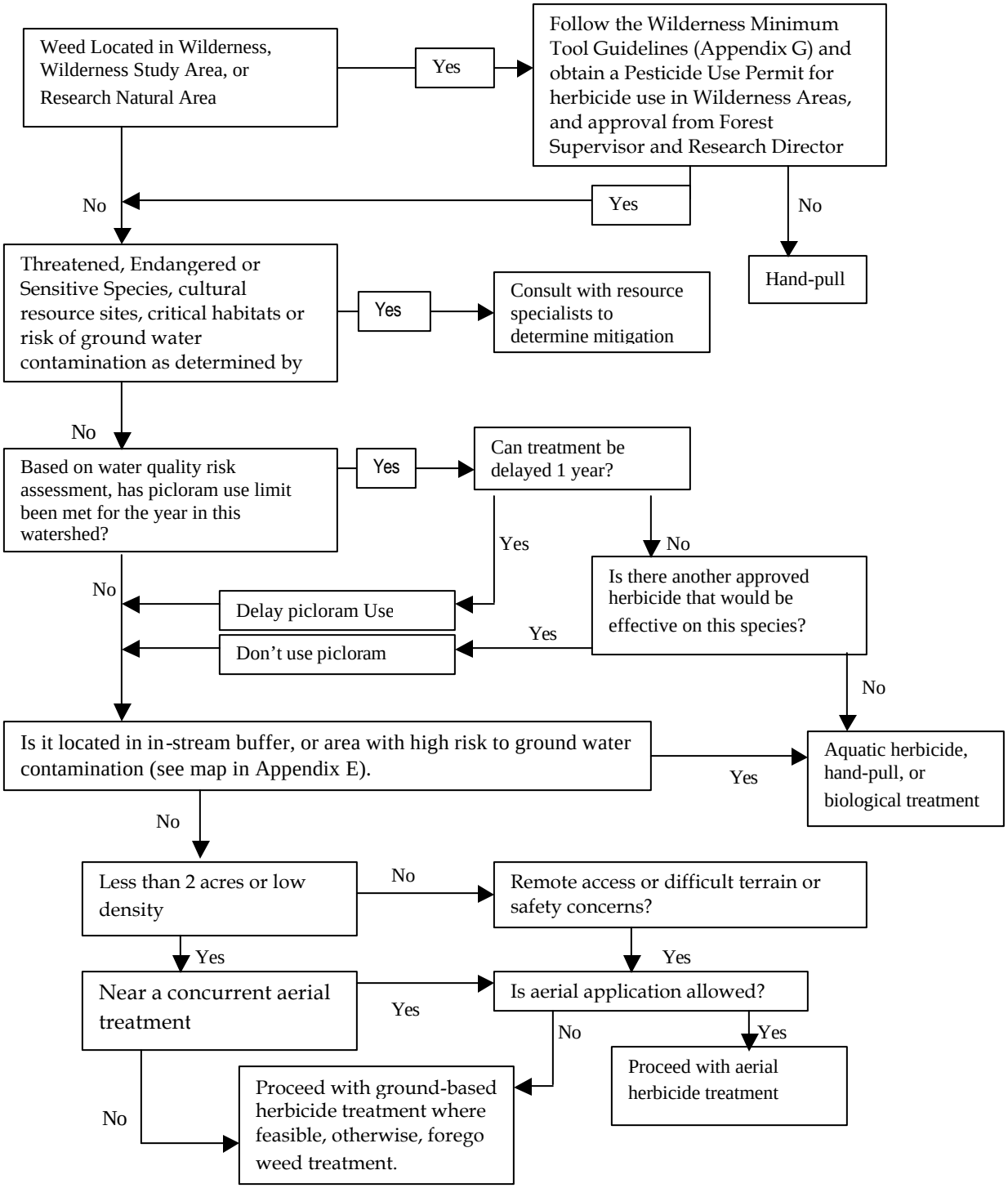
- The decision (if and how) to treat newly discovered infestations would be driven by the Decision Tree for New Weed Locations as shown in Table 2-6;
- New invaders, as identified by local and State agencies, should be given high priority for eradication, if feasible;
- New infestations may be treated with herbicide as long as the acres treated remain within the limits described above and adhere to all mitigation measures listed in this document; and
- Appropriate methods and environmental protection measures described above would be used.

2. To improve effectiveness and reduce impacts, new technologies, biological controls, or herbicides would be evaluated for use.

New technology, biological controls, herbicide formulations, and supplemental labels are likely to be developed within the next 15 years. These new treatments would be considered when there are indications that they would be more weed-specific than methods analyzed here, less toxic to non-target vegetation, or less persistent and less mobile in the soil. Newly registered, water-soluble herbicides that display toxicity, leaching, and persistence characteristics less than or equal to picloram may be used. The Adaptive Management Strategy would allow incorporation of these new treatment methods:

- New herbicides or formulations registered and approved by the US Environmental Protection Agency would be applied according to label specifications;
- Application methods and environmental protection measures described above would be used;
- The decision by the line officer to use a new treatment method would be driven by an interdisciplinary review to confirm that the new treatment is within the scope of the analysis in this EIS, and a site characteristic evaluation (Table 2-6);
- New biological control agents that are approved and certified by the Animal Plant Health Inspection Service; and
- Cost effect mechanical methods of treatments are developed. These methods would be reviewed before use to determine if other resource quality standards can be maintained.

Table 2-6: Decision Tree for New Weed Locations.



ECONOMIC COMPARISON

This decision is about how to, not whether to, manage weeds on the Gallatin National Forest. This section provides the decision maker with comparative information on the relative costs per acre of the alternatives. The figures are taken from expenditures supplied by District weed coordinators. The following table displays the experienced costs for each of the treatment methods being considered:

Table 2-7. Estimated Cost Comparison.

Treatment	Direct Cost per Acre
Manual (Hand Pulling, Digging, etc.)	$400
Ground Applied Herbicide	$100
Aerial Applied Herbicide	$40
Biological Control	$150
Cultural (Grazing, Burning, Planting, etc.)	$250

Hand pulling is the only manual control practical on many parts of the forest. Four people can pull an acre of weeds in one day and the Forest Service commonly assigns this work to seasonal employees at the GS 3, 4 and 5 wage levels. A total cost per acre of $400 dollars is representative of the Forest's experienced costs on many of the more lightly infested sites.

Ground application commonly involves spraying an herbicide from a vehicle, usually a pick-up truck or an ATV. Experienced costs for ground application are approximately $80 per acre to apply Tordon 22-K®, the herbicide most commonly used on the Forest for spotted knapweed. Backpack sprayers cost a minimum of $200 per acre. This system is used less frequently than trucks or ATV's and the production rate (acres treated per hour) is less because applicators have to walk from one site to another. Difficult access increases the costs of both systems and access is frequently the limiting factor determining whether a site can be treated from a vehicle or on foot. For this comparison a value of $100 per acre represents the Forest's experienced costs.

Aerial application costs include both fixed wing and helicopters. This analysis uses a value of $40 per acre since the areas to be treated tend to be small and few areas have been identified as suitable for aerial treatment.

Biological control agents in general have not been in place long enough to show results on an area basis. The Gallatin averages about $750 per site or $150 per acre to collect and release bugs that prey on select invasive plant species.

Cultural work includes the use of fire, grazing, mowing, seeding and other activities that aid in achieving weed defense. A value of $250 per acre will be used in this analysis.

The following table displays the suitable treatments acres, generated by GIS analysis of vegetative data, by treatment method and Alternative:

Table 2-8. Summary of Annual Direct Weed Control Acres by Method. (Since the proposed larkspur treatment is a combination of ground applied herbicide, biological control and cultural control, these acres were not incorporated into the economic analysis).

Alternative	Manual	Ground Applied	Aerial Application	Biological Control	Cultural	Total Annual Treatments	Percent of GNF 1,800,000 ac)	Percent of GNF Weed Base (12,595 ac)
Alternative 1	41	5179	255	4985	2135	12595	0.7	100.0
Alternative 2	130	0	0	7622	2017	9769	0.5	77.5
Alternative 3	281	346	0	535	0	1162	0.06	9.2
Alternative 4	41	5179	0	5086	2135	12441	0.7	98.7

The following table displays the relative costs per acre, by Alternative:

Table 2-9. Relative Cost per Acre by Alternative.

Treatment	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Manual	$16,400	$52,000	$112,400	$16,400
Ground Applied	$517,900	$0	$34,600	$517,900
Aerial Application	$10,200	$0	$0	$0
Biologic Control	$747,750	$1,143,300	$80,250	$762,900
Cultural	$533,750	$504,250	$0	$533,750
Total	$1,826,000	$1,699,550	$227,250	$1,830,950
Relative Cost per Acre	$145	$174	$196	$147

Average appropriations for weed control are about $225,000, annually. Expenditures are increased by various grants from partnership projects and Knutson-Vandenberg Act (KV) funds. KV dollars come from forest project funds and fluctuate with the level of activity on each District. All totaled the average expenditure, forest-wide, per year, is approximately $300,000.

All of the Alternatives show (Table 2-9) a total cost greater than the Forest is budgeted to accomplish on an annual basis. To give a more fiscally realistic portrayal of what the Forest weeds program could be expected to accomplish, the acreage figures in Table 2-10 were revised to (1) limit total annual costs to approximate historic budget amounts and (2) reflect the choices that have to be made when too few dollars are available to fully satisfy the objectives. The following table displays the acres by Alternative and treatment method that could be treated, assuming continuing budget support at historic levels:

Table 2-10. Summary of Annual Direct Noxious Weed Control Acres by Method (Budget Driven).

Alternative	Manual	Ground Applied	Aerial Application	Biologic Control	Cultural	Total Annual Treatments	Total Cost	Percent of GNF Weed Base (12,600 ac)
Alternative 1	1.0	2956.0	0.0	25.0	1.0	2983.0	$300,000	23.7
Alternative 2	5.0	0.0	0.0	1985.0	1.0	1991.0	$300,000	15.8

Alternative	Manual	Ground Applied	Aerial Application	Biologic Control	Cultural	Total Annual Treatments	Total Cost	Percent of GNF Weed Base (12,600 ac)
Alternative 3	281.0	346.0	0.0	535.0	0.0	1162.0	$227,250	7.0
Alternative 4	1.0	2956.0	0.0	25.0	1.0	2983.0	$300,000	23.7

The distribution of acres by treatment method and Alternative was guided by the following assumptions:

1. Table 2-10 reflects the best mix of treatment types given at this time. The Ranger Districts will update their weed priorities each year and adjust treatment priorities accordingly to maximize long-term effectiveness.
2. Aerial treatment is not considered a priority for the $300,000 currently being budgeted. The use of aerial application methods could very well be utilized under Alternative 1, should specific ear marked funding become available and/or issues associated with long-term effectiveness be resolved.
3. Providing for at least some early detection and mechanical pulling of small infestations remains a high priority under every alternative.
4. Cultural treatment types: grazing, burning, seeding, etc while not currently given many acres will increase as technology and native seed sources improves. Emphasis is currently directed towards those wildfire areas having a potential weed problem following a high intensity, high severity burn.
5. Current biological control agents on the Gallatin National Forest have had limited success in limiting weed spread to date. More emphasis will be given to these agents as their effectiveness and spread improves.
6. Alternative 3 – Current Management does not meet the budget ceiling. This is because the acres that can be treated reaches the legal constraint imposed by the governing environmental document (Forest Weeds EIS) before it reaches the fiscal limitation. The reported 281 acres of manual treatment includes a combination of hand pulling, digging, spot spraying, etc.

FEATURES COMMON TO ALL ACTION ALTERNATIVES

Best Management Practices for weed prevention and weed management would be included and followed (see Appendix A).

Establishing native species would be the long-term goal. On some sites, establishing a non-native stand of competitive grasses may be necessary in reducing the cheatgrass competitiveness before replacing with the more desired native species. Re-vegetation would only be used on those sites most prone to noxious weed invasion or erosion.

The Administration Travel Policy would be enforced. The policy conforms to the letter written by former Regional Forester Dale Bosworth in the off-highway Vehicle FEIS for Montana, North Dakota, Appendix D (US BLM, 2001) regarding administrative off-road travel. The Gallatin National Forest policy states: motorized access on National Forest roads, trails, and areas closed to the public will be authorized when it is determined that such motorized use results in efficiencies and cost savings, and resource concerns are considered. Examples of types of

appropriate motorized access include, but are not limited to, noxious weed spraying, fuel reduction projects, transport of fish and game species, timber management activities, resource monitoring, and administration of permits.

MONITORING

A strong monitoring program would be incorporated as part of the adaptive management approach. Monitoring is the collection of data to determine effectiveness of management actions in meeting prescribed objectives. Monitoring would focus on the: 1) density and rate of spread, and the effect these aggressive plants have on natural resources; 2) effects of herbicides on noxious weeds; 3) establishment and effectiveness of biological control agents; and 4) presence of herbicide in surface or ground water in high risk areas (accidental spills, aerial application, or areas with westslope cutthroat trout and sizable acres of weed treatment adjacent to water).

The weed monitoring program includes annual survey and mapping of weed populations. Also, long term growth plots containing yellow toadflax are established for the purpose of measuring rate of weed spread and change in plant composition over time. In addition, long term herbicide test plots and long term biological control plots are also established for the purpose of tracking the effectiveness of control.

Monitoring the aerial application and drift detection would include the following activities. For the first aerial herbicide application of each season adjacent to sensitive resources (streams, lakes, wetlands, sensitive plants) would be monitored to determine the amount and distribution of spray drift. Spray detection cards would be place along the perimeter of the treatment area and inside the buffer around sensitive areas. The cards would be visual examined immediately after spraying and photographed. A written summary of the drift pattern as interpreted from the detection cards and the photos would be used to document the result. If necessary, aerial application methodology will be modified (change buffer size, change to droplet size, use different weather parameters) reduce the amount of drift.

For water quality monitoring, the Forest hydrologist or fish biologist would review the program of work and select sensitive water resources areas to monitor. Water samples would be collected immediately after spraying whenever there is reason to suspect that herbicides may have entered the stream during the spraying operation (such as herbicides detected on drift cards, or if a spill occurred). Laboratory analysis, by an independent lab would test the water samples for herbicides. Water samples would also be collected after the first substantial rain to detect herbicides that could possibly enter surface water through leaching or runoff. Detection of any herbicide will trigger an immediate verification sampling. The used of herbicides in excess of limits defined by Montana Department of Environmental Quality (Montana Numeric Water Quality Standards, Circular WQB-7, see Appendix D for a summary table of limits set for herbicides address in this EIS) will be discontinued. Monitoring would continue (sampling intensity would be adjusted for individual site characteristics) until herbicide is not longer detected.

ENVIRONMENTAL PROTECTION MEASURES

Table 2-11 shows the environmental protection measures that would be implemented for each alternative.

Table 2-11. Environmental Protection Measures.

Protective Measures	Applied to Alternatives(s)
Aerial Application *	
On each side of streams, a 300-foot buffer would be established where aerial applications would not be allowed.	1
Within 300-foot aerial spray buffers, spot ground-application of herbicides may occur. Herbicide selection would be based on product label restriction and site characteristic evaluation. Providing site characteristics are favorable, persistent chemicals (i.e. picloram) could be used to within 50 feet of live water. Less persistent herbicides would be used within 50 feet, again based on site characteristic evaluation and in accordance with herbicide label restrictions.	1
Aerial spray would not occur over areas with over 30 percent live tree canopy	1
Aerial spray units would be ground-checked, flagged, and marked using GPS prior to spraying to ensure only appropriate portions of the unit are aerially treated. A GPS system would be used in spray helicopters and each treatment unit mapped before the flight to ensure that only areas marked for treatment are treated.	1
Cost efficiency of treating smaller infestations would be evaluated based on proximity to larger spray units proposed for aerial treatment.	1
No aerial spraying would be allowed within Zone I and II (800 meters) of an active bald eagle nest from February 1 – August 15.	1
No aerial spraying would be allowed within 400 meters of an active goshawk nest from April 1-August 15.	1
No aerial spraying within 1 mile of an active peregrine falcon nest from April 1 to August 15.	1
Only 8 hours of aerial spraying would be allowed in grizzly bear core habitat within a given Bear Management Subunit each year.	1
Aerial applications would be excluded from Research Natural Areas, Special Interest Areas, designated Wilderness, and near campgrounds or residential areas.	1
Signing and on site layout would be preformed one to two weeks prior to actual aerial treatment.	1
To reduce risk of chronic effects on aquatic species, aerial spray operations would be closely monitored. Field inspectors will provide on-site monitoring for drift and label compliance.	1
Constant communications would be maintained between the helicopter and project leader during spraying operations. Ground observers would have communication with the project leader. Observers would be located at various locations adjacent to the treatment area to monitor wind direction and speed as well as to visually monitor drift and deposition of herbicide.	1
Spray cards would be placed out to 350 feet from and perpendicular to perennial creeks (if close by) to monitor herbicide presence. Non-toxic dye would be added to make herbicide visible on spray cards. Dye would allow observers to see herbicide as it is sprayed and to visually monitor drift or vortices from boom and rotor tips.	1
If needed, aerial treatment areas would be treated repeatedly on a 2 or 3-year rotation to ensure effective control. Monitoring would show which areas would need to be re-treated or if treatment areas can be reduced based on effectiveness of previous treatments.	1
Temporary area and road/trail closures would be used to ensure public safety during aerial spray operations.	1
Drift Reduction	
Drift reduction agents, nozzles that create large droplets, and special boom and nozzle placement, would be used to reduce drift during aerial spraying.	1
Drift control agents may be used in aerial spraying during low humidity to reduce drift into non-target areas. Products that reduce volatility, have been shown to keep droplet	1

Protective Measures	Applied to Alternatives(s)
sizes larger, and are appropriate adjuvant for the herbicide (as specified by labeling of both the herbicide and the drift agent, in consultation with the herbicide manufacturer) would be used.	
Aerial application of herbicides would occur when wind speeds are less than 6 mph and blowing away from sensitive areas.	1
Weather conditions would be monitored on-site (temperature, humidity, wind speed. Direction), and spot forecasts would be reviewed for adverse weather conditions.	1
Herbicide Use	
Herbicides would be used in accordance with US Environmental Protection Agency label instructions and restrictions. Herbicides will not be applied to open water. In areas at risk to groundwater contamination use herbicides with low leachability (see Appendix E). Application would be done or supervised by licensed applicators, as required by law.	1, 3, 4
Procedures for mixing, loading, and disposal of pesticides and a spill plan would be followed. All herbicide storage, mixing, and post-application equipment cleaning is completed in such a manner as to prevent the potential contamination of any perennial or intermittent waterway, unprotected ephemeral waterway or wetland These procedures are outlined in Appendix B. Herbicide applicators shall carry spill containment equipment, be familiar with and carry an Herbicide Emergency Spill Plan.	1, 3, 4
Herbicide treatments in designated Wilderness, Research Natural Areas, and Special Interest Areas will not use motorized vehicles (except for roads or trails in the RNAs or SIAs)	1, 4
Mitigation will apply on sites where leaching to ground water is possible. See decision table (Table 2- 6). Hand pulling will be employed where herbicide use is inappropriate. Relative Aquifer Vulnerability Evaluation (RAVE)/site characteristic evaluation may indicate more restrictive distances than shown on the map (Appendix E).	1, 3, 4
Treatment sites would be evaluated for sensitive plants habitat suitability; suitable habitats would be surveyed as necessary before treatment. If sensitive plant surveys find invasive plants in the area, a weed control plan will be developed to help protect the sensitive plant. Provide the weed crew with maps of all known sensitive plants so that these sites can be identified and protected. Train the weed crew to identify sensitive plants so that new sites can be identified and protected. When using herbicide treatments within 100 feet of sensitive plant (including aerial spray), do not broadcast spray. When treating weeds within 50 feet of sensitive plants: pull the weeds if the soil disturbance will not harm the sensitive plant; use herbicides that do not leach in the soil (glyphosate); applying herbicide when the sensitive plant is senescent, or protect the sensitive plant from herbicide drift by placing a physical barrier (such as a plastic bag) over the sensitive plant, or use a wick application to apply the herbicide directly on the weed so mist is not created.	1, 4
In public recreation areas (such as campgrounds, and trailheads) post treated area until the area is safe to re-enter.	
Surfactants	
Surfactants are proposed for use with the same mitigations as picloram. Only those labeled for use in and around water would be used within 50 feet of water, or the edge of subirrigated land, whichever distance is greater, or on high run-off areas. Some surfactants are labeled for use in and around water including: Activate Plus ®, LI-700 ®, Preference ®, R-11 ®, Widespread® and X-77®.	1, 4
Dyes	
Water-soluble colorants, such as Hi-Light® blue dye, would be used in some situations to enable applicators and inspectors to better see where herbicides has been applied.	1, 3, 4
Biological Controls	
Biological agents would not be released until screened for host specificity and approved by the USDA Animal Plant Health Inspection Service.	1, 3, 4

Protective Measures	Applied to Alternatives(s)
Cultural Treatments	
Mitigations that pertain to grazing with sheep and goats are addressed in the Wildlife section below.	1, 4
Seeding with native seed would only occur if desirable competitive plants do not reemerge and dominate the vegetation community after the weed species is treated.	1, 4
Adjacent Land	
In cooperation with federal, state, and county agencies, Gallatin National Forest boundary land within ¼ mile to intermingled ownership would be selectively treated to coincide with active weed management on adjacent land. Decisions regarding treatment methods and buffer width on land adjacent to privately owned land or land managed by other agencies would be negotiated between the Forest Service and the other owner/agency.	1, 4
Research Natural Areas	
If any treatment with herbicide is planned within RNA or SIA boundaries, concurrence must be obtained through the Research Station Director and Forest Supervisor. This includes any future treatment need of new infestations.	1, 4
No motorized access will be allowed except on the few exceptions where roads exist as identified in the individual establishment record for each RNA or SIA.	1, 2, 4
Wilderness area management will take precedence over RNA or SIA direction when proposed weed control activities are identified for an RNA or SIA within designated wilderness boundaries.	1, 2, 4
Historical Resources	
All historical sites will be avoided in mechanical treatments. Significant sites that could be damaged by multiple off-road travel or equipment will be mapped and provided to weed treatment coordinators in order to avoid any damages.	1, 2, 4
Aquatic	
Herbicide will not be used to control weeds within a 100-foot radius of any potable water spring development on the Forest. Do not use herbicides 1/2mile (100 feet each side) upstream from municipal water divergent point.	1, 4
Picloram will not be used within 50 feet from water bodies, or the edge of subirrigated land, whichever is greater. In watersheds where picloram delivery modeling indicated possible concerns (see Table 2-12) use one or more of the following strategies: • Treat some infestations with another appropriate herbicide (see Appendix D), • Postpone treatment of some infestations for at least 10 to 12 months; and /or • Use biological control as appropriate.	1, 4
INFISH standard FA-4 prohibits storage of fuels and other toxicants within Riparian Habitat Conservation Areas and refueling within these areas unless there is no other alternative.	1, 4
No ester formulations of herbicides will be used. Fish toxicity is the concern.	1, 3, 4
Herbicides sprayed within 50', or the edge of subirrigated land (whichever is greater) and the high water mark of a water body will be those approved for use near water (e.g. Aua-Kleen®, Landmaster®, Glyphomate®, or Rodeo®). Herbicide application within this zone will occur when winds are <10 mph and blowing away from these areas.	1, 4
Western Toads and Leopard Frogs- When ground application of herbicide is necessary within 50 feet of a water body, surveys of the treatment area will be required. If adult northern leopard frogs or western toads, are identified, the extent of distribution within the proposed treatment area will be marked on the ground and reported to the district amphibian specialist (fisheries or wildlife biologist) and weed coordinator within two days. If treatment is not possible without directly spraying individuals then hand pulling or wick application could be applied. If tadpoles or metamorphs of either species are identified, the location will be reported to the district amphibian specialist	1, 4

Protective Measures	Applied to Alternatives(s)
(fisheries or wildlife biologist) and weed coordinator within two days, and application of herbicides will be delayed until metamorphs disperse.	
Wildlife	
No human activities associated with weed control would be allowed within zone I (<400 meters) of an active bald eagle nest from February 1-August 15, except within 20' of roads that are open for public motorized use.	1, 2, 3, 4
Sheep and Goat Grazing - A herder and guard dogs would be present to monitor sheep and goats used for weed control purposes at all times. The herder would be required to notify the local District Ranger within 24 hours of any loss of sheep or goats being used for weed control purposes on the Gallatin National Forest. Sheep and goats being used for weed control purposes would be removed from the Gallatin National Forest within 24 hours of any grizzly bear or wolf depredations. The herder would be required to comply with the Gallatin National Forest food storage order so that human and livestock/pet foods, refuse, and other attractants were made unavailable to bears. The carcasses of sheep or goats that died while being used for weed control would be removed from the Gallatin National Forest within 24 hours to avoid habituation of grizzly bears or wolves to livestock as carrion. Sheep and goats used for weed control would be contained each night within the perimeter of an electric fence. Herders of sheep and goats used for weed control purposed would be required to receive training from the U.S. Fish & Wildlife Service or other authorized organization in the use of hazing techniques to prevent depredations by wolves. Herders would be required to implement those techniques when wolves are known to be in proximity to domestic sheep or goats being used for weed control. Proposals for goat or sheep grazing for weed control purposes would be coordinated with the appropriate MT FWP wildlife biologist to determine if bighorn sheep may occur in the area. At least 9 miles of separation would be maintained between bighorn sheep and domestic sheep or goats being used for weed control purposes.	1, 2, 4
Herbicides would only be applied at concentrations that would avoid tree mortality to protect potential nesting habitat for bald eagles and other species.	1, 4
District/Forest wildlife biologists would review and coordinate weed management projects with the District/Forest weed coordinators to identify current raptor nesting areas, grizzly bear core habitat, wolf territories, or other critical wildlife areas that may be affected by weed control activities, to ensure the mitigation measures described in this report are implemented properly.	1, 2, 4

***** Aerial Herbicide Application for Noxious Weed Control in the Northern Region: Observations, Recommendations and Considerations by Andy Kulla (USFS, 2003) has many suggestions for making aerial herbicide as effective and low-impact as possible based on past experience. These observations, recommendations and considerations would be used in the Gallatin National Forest weed projects whenever possible.

Table 2-12. Picloram Treatment Acres Thresholds in Sensitive Watersheds.

District	HUC Name	HUC Number	Restriction (Annual Application)
Hegben Lake	Upper Madison	100200070202	Do not exceed 90 lbs Active Ingredient
Hegben Lake	SF Madison	100200070203	Do not exceed 29 lbs Active Ingredient
Hegben Lake	Denny	100200070205	Do not exceed 81 lbs Active Ingredient
Hegben Lake	Duck Red Canyon	100200070304	Do not exceed 46 lbs Active Ingredient
Hegben Lake	Hegben Lake	10020007050	Do not exceed 69 lbs Active Ingredient
Hegben Lake	Lower Beaver	100200070603	Do not exceed 36 lbs Active Ingredient
Hegben Lake	Sheep	100200070801	Do not exceed 15 lbs Active Ingredient.

District	HUC Name	HUC Number	Restriction (Annual Application)
Bozeman	Moose Tamphery	100200080602	Do not exceed 22 lbs Active Ingredient
Bozeman	Logger	10020008060	Do not exceed 22 lbs Active Ingredient
Bozeman	Bozeman	100200080803	Do not exceed 62 lbs Active Ingredient
Bozeman	Beasley M	100200080805	Do not exceed 30 lbs Active Ingredient
Bozeman	SF Sixteenmile	100301010302	Do not exceed 55 lbs Active Ingredient
Gardiner	Sphinx Slip and Slide	100700020108	Do not exceed 57 lbs Active Ingredient
Gardiner	Eagle Reese	100700010902	Do not exceed 56 lbs Active Ingredient
Livingston	Deep	100700020108	Do not exceed 36 lbs Active Ingredient
Livingston	Donahue Daily	100700020304a	Do not exceed 32 lbs Active Ingredient
Livingston	Lower Mill	100700020305a	Do not exceed 46 lbs Active Ingredient

ENVIRONMENTALLY PREFERRED AND AGENCY PREFERRED ALTERNATIVE

Alternative 1 is both the environmentally and the agency preferred alternative because it best protects native species and habitat diversity with mitigations adequate to protect other resource value.

SUMMARY COMPARISON OF ALTERNATIVES

With each alternative action, there is a trade-off between beneficial and adverse impacts. This section focuses on issues identified during the scoping process as described earlier in this Chapter. Important components of these issues are impacts to human health, non-target plants, animals, fish, soils, and water. These tradeoffs are analyzed in Chapter 4 and then summarized in Table 2-13. Impacts are based upon the application of appropriate mitigation discussed here.

Table 2-13. Summary of Trade-Offs and Potential Impacts Between Alternatives.

Issue or Concern	Potential Impacts			
	Alt. 1- Proposed Action	**Alt. 2 – No Herbicides**	**Alt. 3- No Action**	**Alt. 4 – No Aerial**
Impacts of weeds: • Loss of native plant community; • Loss of sensitive plant populations; • Human Health (e.g. allergies, asthma)	- Maximizes native species emphasis -Low risk, effective mitigation - Decrease weed impact	- High loss of natives from weeds -High risk (weeds out compete rare plants) - Increased allergies	- Moderate loss of natives from weeds -High risk (weeds out compete rare plants) - Increased allergies	- Some loss of native species, remote areas. -Low risk, effective mitigation - Decrease weed impact
Impacts of using herbicides: • Human health; • Fish and animals; • Non-target plants;	-Low risk, effective mitigation -Low risk, effective mitigation -Low risk -Low risk, effective	- No risk - No risk - No risk - No risk	-Low risk, effective mitigation -Low risk, effective mitigation -Moderate risk -Low risk, effective	-Low risk, effective mitigation -Low risk, effective mitigation

Issue or Concern	Potential Impacts			
	Alt. 1- Proposed Action	**Alt. 2 – No Herbicides**	**Alt. 3- No Action**	**Alt. 4 – No Aerial**
• Water quality	mitigation.		mitigation.	-Minor risk -Low risk, effective mitigation.
Additional risks of aerial spraying: • Human health; • Fish and animals; • Non-target plants.	-Low risk, effective mitigation -Low risk, effective mitigation -Low risk, effective mitigation.	N/A – no aerial herbicide application	N/A – no aerial herbicide application	N/A – no aerial herbicide application
Effectiveness of control actions: • Limit spread, or eliminate existing infestations • Percent area treated based on current budget.	Very Effective 21.6 %	Not Effective 13.6 %	Effective on limited area 8.9 %	Very Effective, except remote areas. 21.6 %
Constraints to users of National Forest	Temporary closure during treatment.	No additional constraints required.	Temporary closure during treatment	Temporary closure during treatment
Wilderness Character: • Natural Integrity • Solitude and Remoteness	-Maximizes natural integrity -Minor short-term effects when recreational users encounter weed control crews.	-Natural integrity erodes the most with increasing weed infestations. -Short-term effects, hand control crews spend more time treating weeds, increasing chances for encounters.	- Natural integrity erodes some with increasing weed infestations. -Minor short-term effects when recreational users encounter weed control crews.	-Improves natural integrity on areas accessible by ground crews. -Minor short-term effects when recreational users encounter weed control crews.